ATTACHMENT 4

NEW CLAIMS

20. A system for monitoring the performance of a DWDM multi-wavelength system comprising:

means for converting an optical signal for a particular wavelength from the DWDM multi-wavelength system to an electrical signal; and

means for processing the electrical signal to determine the performance of the DWDM multi-wavelength system at the particular wavelength and for controlling the converting means so that each particular wavelength of the DWDM multi-wavelength system is processed.

21. The system as recited in claim 20 wherein the converting means comprises a narrow-band tunable bandpass filter having the optical signal as an input and providing the electrical signal as an output.

22. The system as recited in claim 20 wherein the converting means comprises :

an optical unit having the optical signal as an input and the particular wavelength as an output; and

a photodetector having the particular wavelength as an input and the electrical signal as an output.

23. The system as recited in claim 22 wherein the converting means further comprises a lowpass filter having an input coupled to the output of the photodetector and having an output to produce the electrical signal.

24. The system as recited in claim 22 wherein the optical unit comprises a grating spectrometer having the optical signal as input and providing the particular wavelength as an output.

25. The system as recited in claim 24 wherein the grating spectrometer comprises:

a movable grating having a wavelength range that covers a measurement range for the DWDM multi-wavelength system;

an imaging element for reflecting the optical signal; and

a beam deflection system mounted such that the optical signal incident on the imaging element and the optical signal exiting from the imaging element are essentially symmetrical, the movement of the movable grating selecting the particular wavelength, and the optical signal being subjected to multiple passes between the movable grating and the imaging element.

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26. The system as recited in claim 25 wherein the movable grating is mounted with respect to the imaging element and the beam deflection system in a combined array according to Ebert and Faustie and by approximation in a Littrow array.

27. The system as recited in claim 25 wherein the grating spectrometer further comprises a dielectric optical filter situated between the movable grating and the imaging element so that reflections of the optical signal between the movable grating and the imaging element are bandpass filtered.

28. The system as recited in claim 25 wherein the movable grating comprises one selected from the group consisting of a ruled grating and a blazed grating.

29. The system as recited in claim 25 further comprising means for determining an angular position of the movable grating, the angular position determining the particular wavelength.

30. The system as recited in claim 29 wherein the determining means comprises:

a high precision light source for generating a focused beam;

a reflecting surface rigidly coupled to the movable grating upon which the focused beam impinges; and

a position sensor for receiving the focused beam reflected from the reflecting surface to determine the angular position.

31. The system as recited in claim 25 further comprising means for moving the angular position of the grating to select the particular wavelength.

32. The system as recited in claim 31 wherein the driving means comprises:

a drive motor coupled to the movable grating for moving the movable grating about a vertical axis in response to a control signal;

a spring-mass array with torsion bars capable of oscillating coupled to the drive motor; and

means for driving the drive motor in response to the control signal from the controlling and processing means.

33. The system as recited in claim 30 wherein the position sensor comprises:

an incremental scale that influences the intensity of the reflected focused beam as a function of the point on the incremental scale upon which the reflected focused beam impinges; and

a detector for detecting an intensity of light from the incremental scale, the intensity being a measure of the angular position.

34. The system as recited in claim 20 wherein the converting means comprises:

means for mixing the optical signal with a tunable reference optical signal to produce a combined optical signal; and

a photodetector for converting the combined optical signal to the electrical signal.

35. The system as recited in claim 34 wherein the mixing means comprises:

a tunable laser for providing the tunable reference optical signal under control of the processing and controlling means;

means for selectively polarizing the tunable reference optical signal to produce a polarized reference optical signal in one of two orthogonally polarized states; and

means for combining the optical signal and the polarized reference optical signal to produce the combined optical signal.

36. The system as recited in claim 35 further comprising a wavelength calibrator for providing a calibrated wavelength optical signal to irradiate the photodetector.

37. The system as recited in claims 35 or 36 wherein the combining means comprises simultaneous irradiation of the photodetector by the optical signal and the polarized reference optical signal.

38. The system as recited in claim 37 wherein the combining means further comprises simultaneous irradiation of the photodetector with the calibrated wavelength optical signal as well.

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39. The system as recited in claims 35 or 36 wherein the combining means comprises a first optical coupler for combining the optical signal and the polarized reference optical signal.

40. The system as recited in claim 39 wherein the combining means further comprises a second optical coupler for combining the calibrated wavelength optical signal one of the optical signal and polarized reference optical signal prior to combining with the other one in the first optical coupler.

41. The system as recited in claim 34 wherein the mixing means comprises:

means for dividing the optical signal and the reference optical signal each into corresponding orthogonal polarized beams; and

means for combining the respective polarized beams of like polarization to form a pair of combined optical signals as the combined optical signal.

42. The system as recited in claim 41 wherein the photodetector comprises a pair of photodetectors having the respective combined polarized beams as input and providing a pair of electrical signals at the respective outputs as the electrical signal.

43. The system as recited in claim 36 wherein the calibration reference comprises an absorption cell having a calibrated wavelength spectrum.

44. The system as recited in claim 36 wherein the calibration reference comprises an interferometer array including a supplementary light source.